Resource Action: EWG-27 **Task Force Recommendation Category:** X

ISOLATE, MODIFY, FILL OR RECLAIM ROBINSON RIFFLE BORROW PIT

Date of Field Evaluation: January 28, 2004

Evaluation Team: Koll Buer and Bruce Ross assisted by Richard Harris

Description of Potential Resource Action:
The objectives of this Resource Action are:

- Isolate the Robinson Riffle pond at RM 61-62 from the Feather River channel to eliminate its influence on the river geomorphology
- Prevent the trapping of adult and juvenile salmonids in the pit where they are subject to both adverse environmental conditions and predation.

There are other Resource Actions that are similar to or otherwise related to this measure:

- EWG-16B, that proposes to create or enhance side channel habitat in the low flow reach, specifically in the vicinity of Robinson Riffle.
- EWG-93A, that would restore salmonid habitat in the low flow reach through mechanical or hydraulic changes to the channel.

Nexus to the Project:
The gravel mining operation at Robinson Riffle and the effects that it has had on the river are not directly related to the Oroville Project. It is one of many land use activities that have contributed to a cumulative reduction in geomorphic and ecological functions of the Feather River. Investigating this resource action as part of the Oroville Facilities relicensing process may allow for a wider range of solutions when discussing sediment transport issues associated with ongoing operations of the Oroville Facilities.

Potential Environmental Benefits:
Depending on the scope of remedial action(s), environmental benefits could include:

- Improved upstream passage for adult anadromous salmonids
- Improved downstream passage for juvenile anadromous salmonids
- Reduced predation of juvenile anadromous salmonids
- Improved sediment transport
- Enhancement of riparian vegetation
- Increased spawning and rearing habitat for anadromous salmonids through improvements in gravel quality and quantity

Potential Constraints:

The site proposed for this Resource Action is not currently used for gravel mining. The property is owned by DFG?DWR? Restoration would have to be coordinated with the adjacent gravel mining operation.

Other constraints, in addition to funding, may include:

- Availability of material of suitable quality for filling the pit and/or constructing a floodplain and/or building a levee
- Provision of a flow regime that is adequate for restoring geomorphic functions

Existing Conditions in the Proposed Resource Action Implementation Area:
Outputs from Fluvial 12 modeling indicate that an existing gravel mining pit located between RM 61 and 62, adjacent to Robinson Riffle presently functions as a sediment trap in the low flow channel (Attachment 1). This is indicated by sediment transport data (Attachment 2). This has two geomorphic consequences: 1) there is an interruption of sediment transport and 2) a coarsening of bed material composition immediately downstream and potentially upstream (Attachment 3).

Although data have not been evaluated on the fisheries issue, it appears that the gravel pit captures salmonid adults migrating upstream and salmonid juveniles migrating downstream. Because the pit supports a resident population of bass, salmonids captured in the pit are subject to predation. Water temperatures and water quality in the pit may also have adverse impacts on salmonids.

A third potential problem is the diversion of streamflow into the pit. It appears that a portion of the flow (currently regulated at 600 cfs) is diverted into the pit. This may contribute to water temperature constraints on salmonid rearing in the vicinity of Robinson Riffle during the late summer.

There are two major causes for the problem at this location. One is the inadequacy of an existing levee in separating the pit from the river. This levee no longer functions and as a result, streamflow and sediment freely move from the river to the pit. This effect is exacerbated by the fact that the pit bottom is substantially below the elevation of the river thalweg (Attachment 4). The other contributing cause is the excavation itself. Re-measured cross sections indicate the degree of excavation that has occurred since 1970 (Attachment 4). The estimated volume of the pit is 284,000 cu. yds.

Design Considerations and Evaluation:
Potential solutions range on a spectrum from simple to complex. At the simple end, an attempt could be made to reconstruct the existing levees around the pit, thereby preventing diversion of flow and sediment. However this could lead to a reduction in channel capacity and could require the removal of the levee on the opposite side of the river. Or, the pit could be filled to the existing water surface. At the complex end, a floodplain restoration project could be undertaken. This project could include the following components: 1) filling the pit; 2) reconnecting the river to a reconstructed

floodplain; and 3) providing the flow regime necessary to restore floodplain functions. In conjunction with floodplain restoration, side channel habitat could be created, as proposed in EWG-16B.

Synergisms and Conflicts:
Implementation of this Resource Action, although localized, has the potential to improve habitat and geomorphic functions in the low flow reach and can achieve the objectives of several proposed Resource Actions simultaneously.

There would not appear to be any conflicts between other Resource Actions and this one. However, implementing the discretionary elements of this proposal would reduce the resources available for implementing other discretionary measures. Complex solutions associated with restoration projects would be experimental and potentially more costly. Also, there is a need to consider the flow regime requirements of restoring floodplain functions.

Uncertainties:
The main uncertainties associated with this action are: 1) land owner willingness to participate (the land owner is the State of California); and 2) the nature and scope of restoration required to achieve objectives (including attendant costs).

Cost Estimate:
There have been some remarkably similar geomorphic restoration projects undertaken or planned for several other rivers in California. For example, a project on the Tuolumne River involved the partial filling of gravel mining pits, reconstruction of the floodplain and restoration of hydraulic connectivity between the river and its new floodplain. On the Merced River, a similar proposal has been recommended. We have not had sufficient time to explore costs in detail. The Robinson Riffle project would involve roughly one mile of stream and one-half mile of reconstructed floodplain. The estimated costs for projects of similar scale on the Tuolumne and Merced Rivers range from $4 to 8 million. Potential funding sources exist for projects of this type e.g., CALFED restoration program, Abandoned Mine Land Reclamation Program, etc.

Recommendations:
Fortunately, the existence of Fluvial 12, calibrated for the low flow reach, will facilitate both project design and effectiveness monitoring. The model can be used to evaluate different alternatives, considering such issues as sediment transport, required flow regime and off-site effects. Data from other study plans such as T3/5, may provide information on riparian recruitment potential. Modeling outputs, along with existing mapping and cross sections will provide a basis for monitoring project performance. Effectiveness criteria may include:

- Changes in riffle substrate composition
- Continuity of sediment transport
- Stream temperature

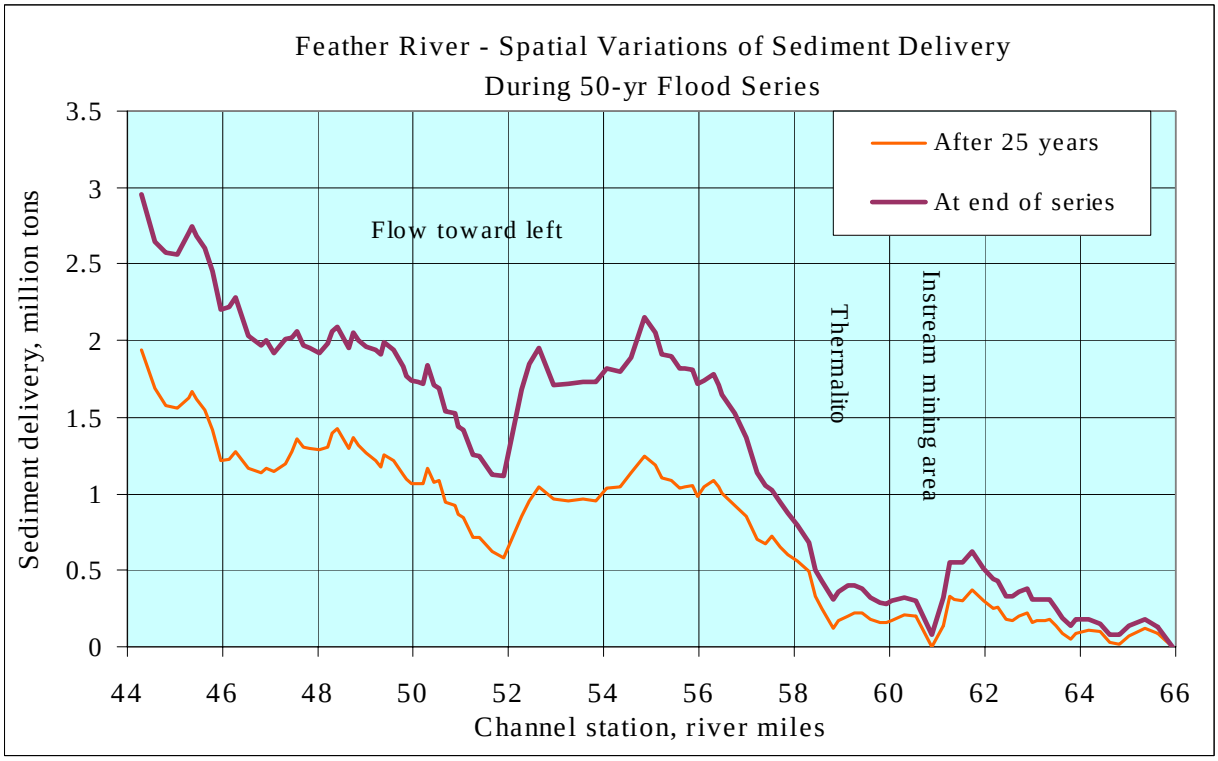
- Riparian vegetation recruitment
- Meso-habitat diversity
- Salmonid spawning and rearing habitat quantities
- Cost

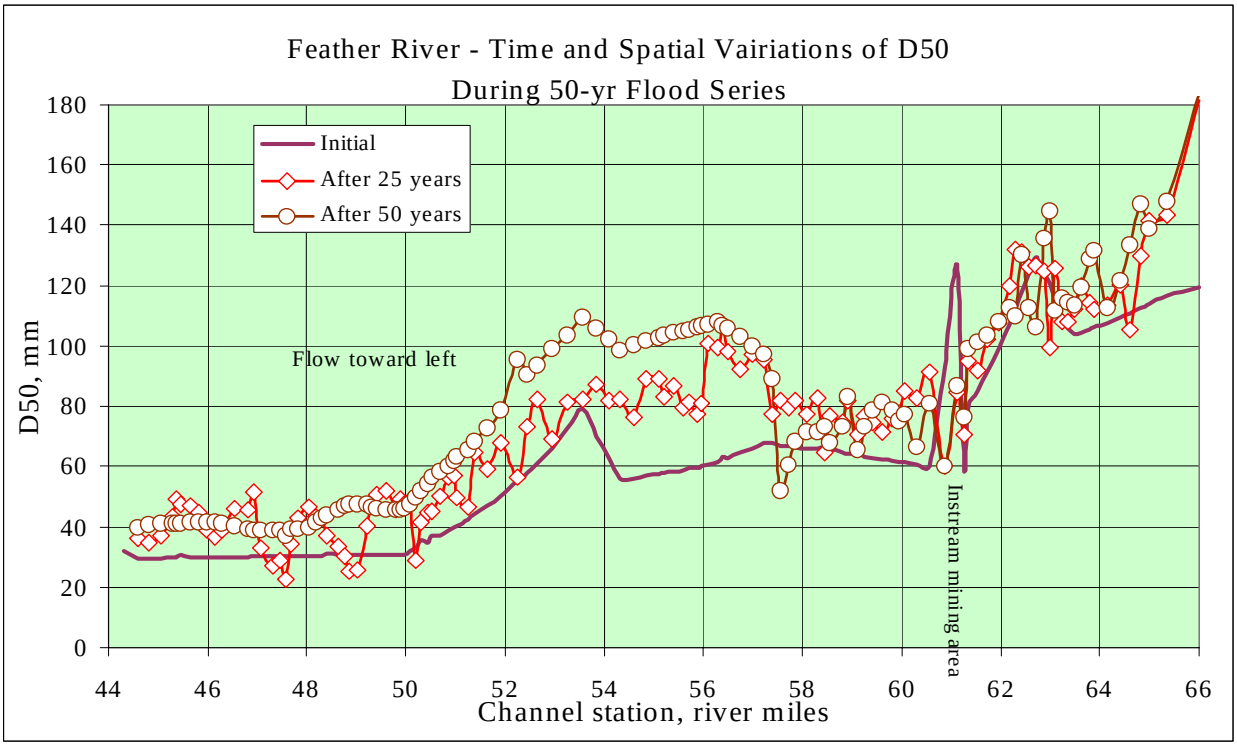
It is estimated that preliminary design alternatives could be developed relatively quickly, given prioritization of the effort. Analysis of design alternatives could also be performed quickly given the wealth of data and modeling capabilities now available. Permitting and construction would probably take up to a year after the design and analysis stages.

Any project of this type requires a serious monitoring and evaluation effort. Similar projects on other rivers have monitoring programs that may last several years. It would be important to develop a monitoring plan as part of the design and planning for this project.

Attachments

Attachment 1: aerial photo of project area
Attachment 2: Chang sediment transport chart
Attachment 3: Change D50 chart
Attachment 4: cross section 1970-1997
Attachment 5: sequential channel locations 1909-1967-2001
Attachment 6: sequential bar growth 1986-2001


Feather River - Spatial Variations of Sediment Delivery
During 50-yr Flood Series
Sediment delivery, million tons
Channel station, river miles
After 25 years
At end of series
Flow toward left
Thermalito
Instream mining area
3.5
3
2.5
2
1.5
1
0.5
0
44
46
48
50
52
54
56
58
60
62
64
66


Feather River - Time and Spatial Vairiations of D50
During 50-yr Flood Series
D50, mm
Channel station, river miles
Initial
After 25 years
After 50 years
Flow toward left
Instream mining area
180
160
140
120
100
80
60
40
20
0
44
46
48
50
52
54
56
58
60
62
64
66


62
61